APPENDIX A – DESIGN CRITERIA AND MITIGATION MEASURES

Design and mitigation measures would apply to all actions. Forest Plan standards and other Agency direction, along with information derived from monitoring past projects, were used to identify design and mitigation measures applicable to the action. Mitigation measures are practices used during implementation of the activities.

Table RA-1: Project Design and Mitigation Measures for the American and Crooked River Project

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
Areas Excluded from Timber Harvest or Fuel Reduction Activities			
1	No timber harvest or mechanical fuel reduction activities would occur in Forest Plan existing or replacement old growth, Inventoried Roadless Areas, streamside RHCAs, or high hazard landslide prone areas	NEPA project design, silviculture prescription, and field prep.	High, based available inventory and monitoring data
Vegetation			
2	Falling would be done to minimize breakage and damage to residual trees.	Field preparation, contract and contract administration/ inspection	High, based on sale administrators' observations
3	Silvicultural prescriptions would be written for each unit, including slash treatment and burn guidelines to meet Riparian Management Objectives	Silvicultural prescription	High, based on protocols for silvicultural certification
Riparian Habitat Conservation Areas			
4	No cutting of trees would be allowed in PACFISH default streamside or wetland RHCAs, except at temporary road crossings, instream habitat improvements, and to facilitate anchoring of cable yarding systems.	Field preparation, contract and contract administration/ inspection	High, based on inventory and monitoring data
5	Post harvest burning will occur in harvest units to reduce slash and fuel resulting from the harvest activities. The burning will be designed and implemented with the intent of restricting burning to stay within the unit boundary. Fire that moves outside the external unit boundary will be suppressed if it poses a threat to riparian resources. On occasion fire will move into small RHCA inclusions within the unit. Burning will not be ignited within these areas, but may be allowed to back into these areas under conditions where fire intensity will be low and burning will not result in extensive reduction in canopy cover or exposure of bare soil in these RHCA inclusions.	FS Fuels management	High, based on Research, PNW Lab, Starkey Project
6	Landslide prone areas are also considered Riparian Habitat Conservation Areas (RHCAs). No timber harvest would occur in areas of high landslide hazard, as described in (1) above. Timber harvest, road construction, or fuel reduction in areas of moderate landslide risk would be modified as needed to protect slope stability. If additional, unmapped landslide prone areas are found during project implementation, areas would be dropped or activities would be modified with watershed specialist oversight to protect slope stability.	NEPA project design, silviculture prescription, and field prep.	High, based on landslide inventory data

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
Soils, Water Quality, and Fish Habitat			
7	Planned activities would be modified in any proposed timber harvest or fuel reduction unit that is found to have previously unidentified significant soil impacts from past human-caused disturbance. The planned activities in that unit would be modified or dropped, or post-harvest restoration implemented to ensure that cumulative impacts would not exceed Forest Plan soil quality standard number 2 (percent of area detrimentally impacted upon completion of activities). Site-specific review of treatment units prior to implementation would identify extent of detrimental soil disturbance.	NEPA project design, silviculture prescription, and field prep.	Moderate, based on research and forest monitoring data (Cullen et al., 1991, Froelich et al., 1983, USDA FS 1988B, 1990, 1992, 1999, and 2003D).
8	Timber harvest and fuel reduction activities would be coordinated with soil restoration activities for greatest efficiency.	Contract administration	Expected to be moderate, little data.
9	Broadcast burning would be applied in preference to excavator piling wherever practical to reduce physical soil damage and to encourage natural regeneration.	NEPA project design, silviculture prescription, and contract.	High, to the degree implemented; based on forest monitoring data (USDA FS 1988B, 1990, 1992, 1999, and 2003D).
10	Temporary roads would be built, used, and decommissioned within a 1 to 3-year period, in order to reduce the amount of sediment production. Coordination of temporary road use and decommissioning with the BLM Eastside Township project would be required.	NEPA project design and contract administration	Moderate, based on implementation monitoring of timber sale contracts and Burroughs and King, 1989.
11	New, temporary roads would be constructed using minimal road widths and out-sloped surface drainage. Road cuts, fills, and treads would be stabilized with annual grass cover where roads are held more than one year. Temporary roads would be located to avoid live water and high-risk landslide prone terrain. If avoidance of live water is not possible, stream crossings would be designed consistent with criteria described below and in Forest Plan Amendment 20 (PACFISH)	Contract and contract administration/inspection	High, based on literature (Water/Road Interaction Technology Series, USDA Forest Service, San Dimas Technology and Development Program, 1999; Burroughs and King, 1989)
12	Coarse woody debris greater than 3 inches diameter would be retained in timber harvest or fuel reduction units in amounts to meet guidelines in Appendix K.	NEPA project design, silviculture prescription, contract, and contract administration.	High effectiveness, based on Graham et al., 1994 and Harvey et al., 1987. Implementation effectiveness has not been monitored.

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
13	Minimize whole tree yarding. Whole-tree yard boles only, leaving tops **and limbs** on site, to maintain foliar nutrients. Over-winter slash at least one winter to allow nutrients to leach into the soil.	NEPA project design, silviculture prescription, BD plan, and contract.	High (Garrison and Moore, 1998; Moore et al., 2004)
14	Winter harvesting would only occur during frozen conditions. Frozen conditions are defined as greater than 4 inches of frozen ground, a barrier of snow greater than two feet in depth (unpacked snow), or one foot in depth (packed snow).	Contract administration	Moderate, based on forest monitoring data (1987 report in project file)
15	Timber harvest, fuel reduction, and soil and stream restoration activities would be limited or suspended when soils are wet, such that resource damage may occur, to reduce rutting, displacement and erosion.	Contract and contract administration/inspection	Moderate, based on forest monitoring (USDA FS 1988B, 1990, 1992, 1999, and 2003D).
16	Skid trails, landings, and yarding corridors would be located and designated to minimize the area of detrimental soil effects. Tractor skid trails would be spaced 80 to 120 feet apart, except where converging on landings, to reduce the area of detrimental soil disturbance. This does not preclude the use of feller bunchers if soil impacts can remain within standards.	Contract and contract administration/inspection	Moderate, based on forest monitoring (Froelich, *et al*, 1981; USDA FS 1988B, 1990, 1992, 1999, and 2003D).
17	On excavator piled units, additional trail construction would be minimized, machines would be restricted to existing trails as much as possible, number of passes would be minimized, and excavator piling would be minimized, to reduce soil compaction. Numerous small piles are preferred to few large piles to avoid nutrient losses and soil alteration that favor weed invasion.	Contract and contract administration/inspection	Moderate, based on forest monitoring (USDA FS 1988B, 1990, 1992, 1999, and 2003D).
18	Cable systems would use one-end or full suspension wherever possible to minimize soil disturbance.	Contract and contract administration/inspection	High where implemented (USDA FS 2003A; Krag, 1991)
19	Excavated skid trails and landings with cut slopes of more than 1 foot would be scarified and recontoured, replacing topsoil as feasible on all landings and trails not needed for harvest within the next 15 years. Winged subsoiler, excavator, or similar equipment is preferred to restore permeability and soil structure.	Contract and contract administration/inspection	High (Plotnikoff et al., 1999; Sanborn et al. 1999A, Sanborn et al., 1999B)
20	Fine organic matter and slash would be scattered over recontoured or scarified areas on skid trails, decommissioned roads, and landings with a goal of achieving 10 tons per acre of fines and 15-20 tons per acre of larger material, up to 35 tons total where available and acceptable to fuel managers. Water bars and seeding of approved weed-free annual or native species would be added as needed for supplementary erosion control.	Contract and contract administration/inspection	High (Sanborn et al., 1999A)
21	Soil restoration areas would be stabilized within 14 days, using erosion barriers, slash, or mulch as needed. Any soil restoration in an activity area would be completed within one operating season, with allowance for additional planting in subsequent seasons.	Contract and contract administration/inspection	Moderate, based on past experience.

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
22	Non-excavated skid trails and landings not needed for harvest within the next 15 years, that have been cut, compacted or entrenched 3 inches or more would be scarified to a depth of 4 – 10 inches, or as directed by contract administrator, to restore soil permeability. Excavator, winged subsoiler or similar equipment is preferred, to avoid mixing surface ash layer and subsoil.	Contract and contract administration/inspection	Moderate to high (Froelich et al., 1983; Froelich et al, 1985;Foltz and Mallard, 2004; Luce, 1997)
23	Sediment and erosion control measures such as dewatering culverts, sediment barriers, rocking road surfaces and/or ditches, etc., would be used as needed when constructing, reconstructing, and decommissioning roads to protect fish habitat and water quality.	Contract and contract administration	High, based on literature, San Dimas, Road/Water Interaction
24	Activities including stream crossing road improvements would be conducted in fish bearing streams between July 1 and August 15 to avoid sediment deposition on emerging steelhead or Chinook redds, or disturbance to bull trout moving to natal streams. These dates may be site-specifically adjusted through coordination with the Central Idaho Level I team and other agencies.	NEPA project design, contract and contract administration/inspection	Moderate to high, based on past experience.
25	Stream crossing structures would provide for channel width, flow velocities, substrate condition, and stream gradients that approximate the natural channel and accommodate passage of streamflow, debris, fish, and other aquatic organisms, and would use PACFISH standards. When designing new structures, consider and give preference to open-bottom arches, bridges and oversized culverts.	NEPA project design, contract and contract administration/inspection	High, based on literature, San Dimas, Road/Water Interaction
26	During instream habitat improvement activities, tree felling in RHCAs would occur only where that activity would not affect Riparian Management Objectives for shade and woody debris recruitment. Wood for instream placement would be taken from outside the RHCA wherever feasible.	Contract and contract administration/inspection	High, based on past experience.
27	Prior to instream habitat improvement activities, heavy equipment would be inspected to assure no leakage of oil, fuel, or hydraulic fluid.	Contract and contract administration/inspection	Moderate to high, based on past experience.
28	A Spill Prevention Control and Countermeasures Plan (40 CFR 112) would be prepared and implemented that incorporates the rules and requirements of the Idaho Forest Practices Act Section 60, Use of Chemicals and Petroleum Products; and US Department of Transportation rules for fuels haul and temporary storage; and additional direction as applicable.	Contract and contract administration/inspection	High, based on past experience.
29	For instream activities in fish-bearing streams that contain listed species, fish are expected to disperse from the activity area. If needed, additional measures would be used to ensure fish are not harmed or killed by instream activity. If electrofishing were necessary, it would be conducted in accordance with NOAA Fisheries electrofishing guidelines found at http://www.nwr.noaa.gov.	Contract and contract administration/inspection	Moderate, based on past experience.
30	The State of Idaho Best Management Practices (BMPs) and Forest Service Soil and Water Conservation Practices (SWCPs) would be applied. These are incorporated by reference.	Contract and contract administration/inspection	High, based on past experience.
	Trails/Recreation		
31	Coordination would minimize conflict with winter hauling on roads used as groomed snowmobile routes.	Project design, contract and contract administration/ inspection	Moderate, based on past experience.

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
32	Trails 820, 832, 838, 844, 848, and others as identified, would be protected during activities. Designate all system trails as Protected Improvements in the Timber Sale Contract. No skidding across trails, except over snow, fall trees away from trails, cut stumps less than 12" in height within 100 feet of trails, leave regeneration within 100 feet of trails to create a visual buffer between treatment areas and trails, construct firelines to protect the regeneration buffer and trail during slash treatment, and trails are not to be used a firelines.	Contract and contract administration/inspection	High, based on past experience.
	Access/Public Safety		
33	Temporary roads would be closed to public use, except as specifically authorized.	Contract and contract administration/inspection	Moderate for sediment reduction and wildlife security, based on monitoring
34	Operator would be required to set up warning signs advising of equipment operations or hazards for public safety.	Contract and contract administration/inspection	High, based on past experience.
	Air Quality		
35	Procedures outlined in the North Idaho Smoke Management Memorandum of Agreement would be followed, including restrictions imposed by the smoke management-monitoring unit.	FS fuels management	High, based on burning approval required daily by smoke monitoring unit.
36	Prescribed burning would be conducted over several years to reduce the amount of smoke in any one year. Priority in scheduling would be given to units accessed by temporary roads scheduled for decommissioning	FS fuels management	High, based on past experience, and availability of burn windows and/or personnel.
37	Additional restrictions, beyond those imposed by the smoke management-monitoring unit, would be considered for prescribed burning for local air quality reasons, including visual.	FS fuels management	High, based on past experience.
	Wildlife		
38	Snag and snag replacement green trees would be retained in numbers consistent with Regional Guidelines (Appendix K)	Field preparation , NEPA project design, contracting and contract administration	High except where safety concerns or wood cutting result in loss.
39	Should any of the following be sighted in the project area during project layout and implementation, the U.S. Fish and Wildlife Service and unit biologist would be notified: lynx or a lynx den, bald eagle, new wolf den or rendezvous site, active goshawk nest. Appropriate protection measures would be implemented where deemed necessary to protect these species.	NEPA project design, silvicultural prescription, field prep, contract administration/inspection, and USFWS monitoring	Moderate; based on public sightings reports and ESA section 7 consultation.
40	Should an active goshawk nest be discovered within a 450 feet distance of timber harvest or fuel reduction activities, the nest tree will be protected, as well as a 10-15 acre no-treatment buffer area around the nest tree, as designated by the unit biologist to provide for foraging and nesting sites.	Field prep, contract and contract administration/ inspection	Moderate; based on IDFG, et al, 1995, State Conservation Effort

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
41	The integrity of existing access management restrictions would be maintained within the planning area for wildlife security purposes. Current access management restrictions would apply to existing reconstructed roads after implementation of activities to maintain or improve existing access and wildlife security. No contractor or their representatives may use motorized vehicles to hunt or trap animals on a restricted road.	Contract and contract administration/inspection	High except close to roads; based on standard timber sale contract clauses and past results monitoring .
	Heritage Resources		
42	Known historic properties or sites would be avoided or protected.	NEPA project design, field prep, contract, and administration/inspection	High, objective to achieve a "no adverse effect" on these resources
43	If additional cultural resources are discovered during project operations, all ground-disturbing activities in that area will be halted until such resources can be properly documented and evaluated by the Forest Archaeologist in compliance with 36 CFR 800.13b3	Contract and contract administration/ inspection	Moderate based on recognition of resource and contact with Heritage personnel
	Noxious Weeds		
44	Desirable vegetation would be promptly established on all disturbed areas, using native and non-native plant species, as approved by the Forest botanist.	Contract and contract administration/inspection	Moderate based on experience
45	All named plant cultivars used in revegetation will be certified blue-tagged. All non-certified seed will be tested by a certified seed laboratory against the all state noxious weed list and documentation of the seed inspection test provided to the contract administrator. All straw and mulch would be certified as free of noxious weed seed.	Contract and contract administration and inspection	High, based on experience
46	All mud, soil and plant parts would be removed from all off-road equipment associated with the project before moving into the project area to limit the spread of weeds. Cleaning must occur off National Forest lands. This applies to all ATVs used on and off roads in the project area, but does not apply to service or hauling vehicles that would stay on the roadway, traveling frequently in and out of the project area.	Contract and contract administration and inspection	High; based on past experience
47	All private rock used for surfacing would be county-certified as free of noxious weed seed. Forest Service rock sources will be reviewed for invasive weeds by a forest weed specialist or botanist. Borrow pits and stockpiles will not be used if it is determined that it is infested with an invasive plant that is not found in the area where the material will be placed.	Contract and contract administration/ inspection	Moderate; based on past experience
48	All small outbreaks of invasive weeds within the project risk zones (Map 16b), and along all haul routes leading to weed risk zones will be pretreated prior to ground disturbing activities under the existing wee management program.	Field prep, contract	High: based on past experience
	TES Plants		
49	Candystick, a former Region 1 sensitive plant species, occurs in some management units. Where live lodgepole are associated with candystick, groups of live lodgepole pine would be left to protect candystick from management activities.	NEPA project design, field prep, contract and contract administration/ inspection	High based on past monitoring and experience.

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
50	During implementation, if activities would impact previously unknown sensitive plant occurrences, appropriate protection measures would be implemented. Appropriate measures will vary depending upon the ecology of the species involved and nature of the proposed action and would be directed by a botanist.	Silvicultural prescription, field preparation, contract, and contract administration/inspection	High based on monitoring, experience, and logic.
	Roadside Salvage[1]		
51	Roadside salvage would be limited to dead or dying trees, with no harvest of standing trees more than 20 inches in diameter. (Windthrown trees would not be subject to the diameter limit.)	Contractor permit	High; based on based experience and accessibility to sites
52	Salvage would be limited to areas adjacent to haul roads. No tree cutting or yarding would occur in RHCAs or in allocated existing or replacement old growth.	Contractor permit	High; based on based experience and accessibility to sites
53	All yarding would be done from the road. Areas above steep cutslopes that cannot be protected from yarding damage would be omitted from salvage. Yarding distance would not exceed 100 feet.	Contractor permit	High; based on based experience and accessibility to sites
54	No more than 80 dead or dying trees per mile (approximately 8 trees/acre) could be designated for cutting on each side of the road.	Contractor permit	High; based on based experience and accessibility to sites
55	Maximum opening size is one acre on each side of a road, or a maximum of 400 feet along the road.	Contractor permit	High; based on based experience and accessibility to sites
56	Openings would be separated from other forest openings by at least 200 feet of pole size or larger forest along the road, on both sides, to provide cover for wildlife crossing.	Contractor permit	High; based on based experience and accessibility to sites
57	Slash from salvage would be lopped and scattered, hand piled and burned in the woods, or removed from the site at the discretion of the District Ranger considering the Forest objective of maintaining less than 12 tons per acre of fine fuels.	Contractor permit	High; based on based experience and accessibility to sites

[1] Treatments would include roadside salvage within 100 feet of main haul roads. This component of the action would comply with all applicable design criteria developed for the action as a whole. These design criteria are not intended to limit or interfere with brushing, clearing, or hazard reduction activities associated with routine road maintenance.

Correction: Between the draft and final EIS for the American and Crooked River project, we erroneously dropped the following design criteria. After investigation, it was determined that it needed to be added back into the project.

Project Design and Mitigation Measures.

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
8a	Tractor yarding will be limited slopes less than 35 percent, with the exception of small inclusions in the unit.	NEPA project design, silviculture prescription, and field prep.	High, based on past experience.